# ARITHMETIC APTITUDE

## WELCOME ALL

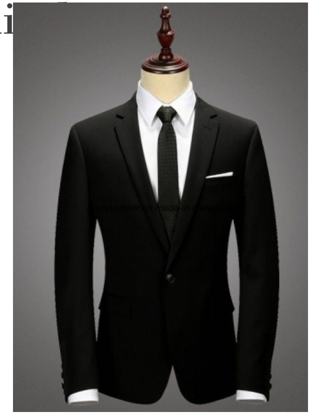
SHABANA

# MONEY

Mayor Brogan was a man of great honesty. The other day he went to his favourite Haberdashery store and said to the man in the hat department, "I want that $10.00 hat in the window. If you lend me as much as I have in my pocket I'll buy it".

The sales man said ok and gave him the money. The mayor then paid cash for the

hat. Next he went to the sui



and bought a $10.00 jacket using the same proposition. On the way out he stopped in the Shoe department and bought a $10.00 pair of shoes, paying in the same way. When he left the store, he had no money in his pockets.

How much money did Brogan have when he first entered the store?

| | |
|---|---|
| Introduction / Arithmetic Aptitude - I | Divisibility , Co Prime Factor pairs, Short cuts to find Squares, cubes, square roots, cube roots - 2 digit & 3 digit numbers |
| Arithmetic Aptitude - I | Divisibility , Co Prime Factor pairs, Short cuts to find Squares, cubes, square roots, cube roots - 2 digit & 3 digit numbers |
| Arithmetic Aptitude - II | Remainder Concepts, Progression, Last digit, Last two digits, Surds, Indices, Algebra |
| Ratios, Averages and Ages | Bridging components, Standard & Variable data, Removal & Replacement in Averages, Application on ages |
| Commercial Math | Percentage expressions, Percentage change, Net percentage change, Profit, Loss, Discounts, Mark ups |
| Partnership & Alligations | Investments, Shares, Withdrawals, Alligation rule and its applications in other concepts |
| Analytical & Inductive Reasoning | Comparing, different verticals of data |
| Data Arrangement | Blood relations - 4 types, Seating arrangement - Facing in / out, Combining datas |
| Time & Distance | Componendo & Dividendo concepts, Distance / Time reference, Trains, Boats & Streams, Races |
| Time & Work | Chain rule, And / Or Concept, Efficiency, Comparisons, Pipes & Cisterns |
| Worksheet | Time and Distance & Time & Work |
| Cubes, Cuboids & Dices | Standard & General Dices, Cubes, Painted and Blocked cubes, Painted cuboids, Cubes - numbered |
| Spatial Aptitude & Transfor-mation of shapes | Figure series, Tricks to find the number of triangles, Flowcharts |
| Probability | Basic Definitions & Concepts, Theorems of Probability and their applications, Expected value |
| Permutations & Combinations | Fundamental principle of counting, And - Or Simplification, Together and never concepts, at least and at most approach to solve problems |
| Venn diagrams | General approch to different set of datas |
| Syllogisms | Basic diagrams, connectives, Conclusions with No and Conclusions with Possibility |
| Mensuration | Triangles, Quadrilaterals, Regular polygons, Circles, Rectangular solids, Prisms and Spheres |
| Geometry | Lines & Angles, Parallel lines, Triangle Properties, Heights & Distances |
| Coding Decoding, Crypt Arithmetic | Number matching, different symbols, Matrix matching, Number based crypt arithmetic problems |
| Series, Analogies & Number puzzles | Missing numbers, letters and number based and series and analogies, symbols and notations |
| Data Interpretation | Table chart, Bar graphs, Line chart, Pie charts and combination of them |
| Data Sufficiency | Based on analytical ability, coding, blood relations, ranking and seating |
| Puzzles, Miscellaneous | Linear equations with 1 and 2 variables, Quatratic equations and equations of a higher degree, Logarithm, Inequalities, Input/Output Ma- |

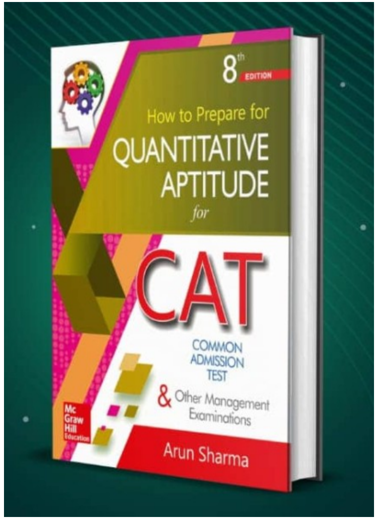
# EVALUATION PATTERN

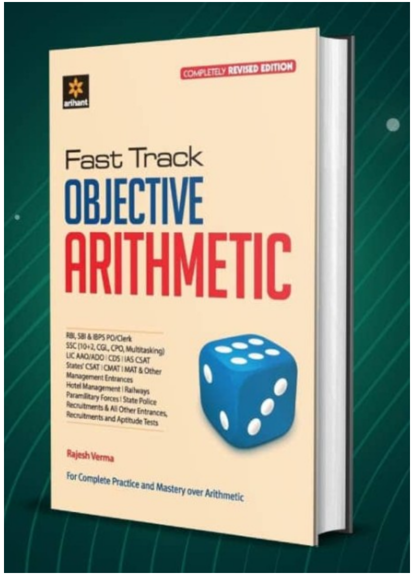
MID EXAM – I – 25%
MID EXAM – II – 25%
END SEM EXAM – 50%

# REFERNCE BOOKS

QUANTITATIVE APTITUDE FOR CAT - ARUN SHARMA

FAST TRACK OBJECTIVE ARITHMETIC, ARIHANT PUBLICATIONS



# TOPICS

- DIGITAL ROOTS
- SHORTCUTS – SQUARES OF 2 & 3 DIGIT NUMBER
- SHORTCUTS – CUBES OF 2 & 3 DIGIT NUMBER
- SHORTCUTS – SQUARE ROOT & CUBE ROOTS OF PERFECT SQUARE NUMBERS
- CO PRIME FACTOR PAIRS
- TIPS TO FIND IF THE GIVEN NUMBER IS PRIME
- DIVISIBILITY RULES

# DIGITAL ROOT

Find the digital root of 58762301

- Digital root of any perfect square will fall among 1, 4, 7, 9 only
- Not any prime number except 3 will have 3, 6 or 9 as its digital root

# SIMPLIFY

1777 – 2349 – 1345 + 6523

a. 4706
b. 4606
c. 4976
d. 4176

5016 x 1001 – 333 x 77 + 22 = ? X 11

e. 435570
f. 454127
g. 527240
h. 366531

# SIMPLIFY

2387 – 123 + 980 = ? – 145 + 945

a. 2244
b. 2355
c. 2434
d. 2444

135% of 342 – 342% of 15.3

e. 411.13
f. 412.23
g. 414.43
h. 415.53

# SQUARES OF 2 DIGIT NUMBER

- ENDING WITH ZERO
- ENDING WITH 5
- ENDING WITH ANY OTHER DIGIT

# SQUARES OF 3 DIGIT NUMBER

- LESS THAN 316 / GREATER THAN 317
- TYPE A – Rounding off to less than nearest 50
- TYPE B – Rounding off beyond 50

# CUBES OF 2 DIGIT NUMBER

- ENDING WITH ZERO
- STARTING WITH 1
- ENDING WITH 1
- DOUBLETS
- ENDING WITH ANY OTHER DIGIT

# CUBE OF 3 DIGIT NUMBER

$(102)^3$

$(103)^3$

$(110)^3$

# SQUARE ROOT

1521 =

2209

6724

8649

$1^2 = 1$
$2^2 = 4$
$3^2 = 9$
$4^2 = 16$
$5^2 = 25$
$6^2 = 36$
$7^2 = 49$
$8^2 = 64$
$9^2 = 81$
$10^2 = 100$

# CUBE ROOT

19683 =

157464 =

912673 =

$1^3 = 1$
$2^3 = 8$
$3^3 = 27$
$4^3 = 64$
$5^3 = 125$
$6^3 = 216$
$7^3 = 343$
$8^3 = 512$
$9^3 = 729$
$10^3 = 1000$

# DIVISIBILITY RULES

| Rules of Divisibility | | |
|---|---|---|
| **Divisible by** | **Conditions** | **Examples** |
| 2 | Last digit is 0, 2, 4, 6, or 8 | 752, 300678, 890 |
| 3 | Sum of the digits is divisible by 3 | 5673<br>5+6+7+3 = 21<br>21 ÷ 3 = 7 |
| 4 | Last two digits is divisible by 4 | 7624<br>24 ÷ 4 = 6 |
| 5 | Last digit is 0 or 5 | 670, 735 |
| 6 | Number is divisible by 2 and 3 | 8862<br>8+8+6+2 = 24<br>24 ÷ 3 = 8 |
| 7 | Double the value of the last digit and subtract the result from the rest of the number. The answer is divisible by 7. | 385<br>38 – (2 × 5) = 28<br>28 ÷ 7 = 4 |
| 8 | Last three digits of a number is divisible by 8. | 1800<br>800 ÷ 8 = 100 |
| 9 | Sum of the digits is divisible by 9 | 378<br>3 + 7 + 8 = 18<br>18 ÷ 9 = 2 |
| 10 | Last digit is 0 | 8740 |

# IMPORTANT FORMULAS & STRATEGIES - NUMBERS

Sum of first n natural numbers = *n(n+1)/2*

Sum of the squares of first n natural numbers = *n(n+1)(2n+1)/6*

Sum of the cubes of first n natural numbers = $[n^2(n + 1)^2] / 4$

Sum of first n natural odd numbers = $n^2$

## Arithmetic Progression

$t_n = a + (n – 1)d$

$S_n = n[2a + (n – 1)d] / 2$

where 'a' is the first term, 'd' is the common difference, $t_n$ is the nth term and $S_n$ is the sum of n terms.

## Geometric Progression

$tn = a\, r^{(n-1)}$

$Sn = a(r^n – 1) / r – 1$ , when r>1

$Sn = a(1 - r^n) / 1 - r$ , when r<1

Sn = nxa, when r = 1

where 'a' is the first term, 'd' is the common ratio, tn is the nth term and Sn is the sum of n terms.

# HCF & LCM – RAPID INFORMATION LIST

| S.No | Type of Problem | Approach to Problem |
|---|---|---|
| 1 | Find the greatest number that will exactly divide x, y and z. | Required number = HCF of x, y and z |
| 2 | Find the greatest number that will divide x, y and z leaving remainders a, b and c respectively | Required number = HCF of (x – a), (y – b) and (z – c) |
| 3 | Find the least number that is exactly divisible by x, y and z. | Required number = LCM of x, y and z |
| 4 | Find the least number which when divided by x, y and z leaves remainder a, b and c respectively. | Then it is observed that x – a = y – b = z – c = k<br>Required number = (LCM of x, y, z) – k |
| 5 | Find the least number which when divided by x, y and z leaves the same remainder 'r' | Required number = (LCM of x, y, z) + r |
| 6 | Find the greatest number that will divide x, y and z leaving same remainder in each case | Required number = HCF of (x - y), (y – z) and (z – x) |

# HCF & LCM OF FRACTIONS

$$\text{HCF OF FRACTIONS} = \frac{\text{HCF OF NUMERATORS}}{\text{LCM OF DENOMINATORS}}$$

$$\text{LCM OF FRACTIONS} = \frac{\text{LCM OF NUMERATORS}}{\text{HCF OF DENOMINATORS}}$$

# FEW REMAINDER CONCEPTS

- $X^n + 1$ will always be divisible by $X + 1$ only when n is odd.
- $X^n – 1$ will always be divisible by $X + 1$ only when n is even.
- $x^n – a^n$ is always divisible by $x – a$ for all values of n.
- $x^n – a^n$ is always divisible by $x + a$ for even values of n.
- $x^n + a^n$ is always divisible by $x + a$ for odd values of n.
- $x^n + a^n$ is not divisible by $x – a$ for any value of n.
- For any value of n, if any number $(kx + 1)^n$ divided by x will leave a remainder $1^n$
- When p is a prime number and N is any natural number not divisible by p, then $N^{p-1}$ if divided by p will leave a remainder 1.

# FACTORS & MULTIPLES

| NUMBER | NO.OF FACTORS | NUMBER | NO.OF FACTORS |
|---|---|---|---|
| 54400 | | 557 x 699 | |
| 54400 x 30600 | | 1230 x 2870 | |
| 444 x 888 | | 3220 x 5290 | |
| 120 x 240 x 360 | | $(3230)^2$ | |

# FACTORS

**TO FIND THE NUMBER OF FACTORS**

Express the number as $N = a^p \times b^q \times c^r$

No. of factors = $(p+1)(q+1)(r+1)$

Sum of the factors = $[a^{p+1} - 1 / a - 1]\,[b^{q+1} - 1 / b - 1]\,[c^{r+1} - 1 / c - 1]$

Product of the factors = $N^{(p+1)(q+1)(r+1)/2}$ (Including 1 & N)

# TRAILING ZEROES

| NUMBER | NO.OF TRALING ZEROES | NUMBER | NO.OF TRALING ZEROES |
|---|---|---|---|
| 153! | | 332! + 400! | |
| 188! | | 325! X 53! | |
| 122! | | 153! + 188! | |
| 224! | | 122! X 224! | |

# LAST DIGIT

| NUMBER | LAST DIGIT | NUMBER | LAST DIGIT |
|---|---|---|---|
| $(999)^{888}$ | | $(557)^{699} \times (699)^{557}$ | |
| $(544)^{688} \times (306)^{405}$ | | $(123)^{287} \times (287)^{123}$ | |
| $(445)^{975} \times (888)^{932}$ | | $(322)^{529} \times (529)^{322}$ | |
| $(122)^{244} \times (244)^{366} \times (366)^{122}$ | | $(32)^{22} X (88)^{44} X (66)^{66}$ | |

# LAST TWO DIGITS

| NUMBER | LAST TWO DIGITS | NUMBER | LAST TWO DIGIT |
| --- | --- | --- | --- |
| $(81)^{399}$ | | $(125)^{124}$ | |
| $(171)^{867}$ | | $(275)^{275}$ | |
| $(43)^{162}$ | | $(46)^{250}$ | |
| $(119)^{456}$ | | $(88)^{102}$ | |

# LAST TWO DIGITS

Case – 1 – Ending in 1
Case – 2 – Ending with 3, 7, 9
Case – 3 – Ending with 5
Case - 4 – Ending in even numbers